IN THE SPECIFICATION:

Before the Heading beginning at page 1, line 1, insert the new heading as follows.

BACKGROUND OF THE INVENTION

Replace the paragraph at page 1, line 22 with the following rewritten paragraph.

However, this thickness must not increased too much as the insert would be unusable for tapping holes of a limited diameter, owing to the contact between the heel of the tooth and the edge of the orifice machined. It would be conceivable to increase the relief angle, i.e., to reduce the wedge angle of the lateral profile of the cutting edge, but the latter would become too fragile and would run the risk of chipping, or nicking, owing to the increased overhang, that is to say, if the back part of the tooth provided only insufficient bracing.

Replace the paragraph at page 1, line 30 with the following rewritten paragraph.

In the case of an application for external thread cutting, the relief angle can, of course, be practically nil and the thickness can be relatively great, but the cutting edge remains sensitive to ~~the localised~~ localized external stresses present in this area such as, for example, vibrations.

Replace the paragraph at page 2, line 3 with the following rewritten paragraph.

The present invention ~~aims to provide~~ provides a solution intended to treat at least one of the problems mentioned above, i.e., mechanical stress resistance, overall thickness and

manufacturing cost, in order to at least attenuate the corresponding drawbacks.

Replace the paragraph at page 2, line 8 with the following rewritten paragraph.

For this purpose, the present invention provides a thread cutting insert including a laterally projecting tooth comprising a front, chip cutting and repelling face, delimited by a cutting edge separating it from a flank area with a profile having a determined overall relief angle, ~~characterised by the fact that~~ wherein the tooth comprises, rearwards of a forward volume part directly supporting the cutting edge and limited by the flank area extending over a limited thickness, a part serving to brace the forward volume part, having a profile with an average relief angle differing from the overall relief angle of the profile of the flank area.

Replace the paragraph at page 2, line 17 with the following rewritten paragraph.

Thus, the tooth functionally comprises two stacked layers that cooperate in order to support the cutting edge, [[since]] because the bracing part forms a pedestal making its contribution, in order to support the cutting edge, through the forward part.

Replace the paragraph at page 2, line 21 with the following rewritten paragraph.

[[As]] Because the forward part, or frontal layer, has a limited thickness which is less than the total thickness of the insert, it is easy to provide for the relief angle of the front part to be

restricted to a small value, or even for it to be nil, that is to say, to provide for a maximum wedge angle, there thus being a [[maximal]] large mass of material behind the front face.

Replace the paragraph at page 2, line 26 with the following rewritten paragraph.

In the case of thread tapping, the risk of unwanted rubbing of the heel of the bracing part on the surface of a bore of limited diameter can be avoided [[since]] because this heel can, ~~thanks to~~ as a result of an increased angle of "positive" relief of the bracing part, remain standing back and within the circle representing the cross-section of the bore. The overhang of the cutting edge can thus be restricted [[since]] because its extent is proportional to the relief angle and to the thickness of the forward part. The front face of the tooth is thus braced substantially perpendicularly by the material of the forward part, located ~~practically~~ behind practically all of the cutting front face. [[As]] Because the overhang is restricted, the thickness of the forward part of the tooth, even when limited, is, as it is, able to locally ensure satisfactory support for the cutting edge, without the help of the bracing pedestal layer.

Replace the paragraph at page 3, line 5 with the following rewritten paragraph.

In the case of external thread cutting, the average relief angle of the bracing part can be chosen to be negative, that is to say, that the bracing part can take the form of a rostrum, or spur, designed to substantially mate with the curvature of the work-piece.

Replace the paragraph at page 3, line11 with the following rewritten paragraph.

In particular, in this case, the average relief angle of the bracing part is preferably negative so that the bracing part forms the spur, designed to substantially mate with the curvature of a piece having a cylindrical outer surface on which a thread is be cut, with the spur extending laterally, towards the piece for thread cutting, further than a point of junction between the flank area of the forward part and a corresponding flank area having [[said]] <u>the</u> profile of the bracing part.

Replace the paragraph at page 3, line 20 with the following rewritten paragraph.

In both cases, internal or external thread cutting, the bracing part thus ensures additional resistance to mechanical stresses, with its mass being added to that of the rest of the tooth to thus increase the inertia of the tooth, hence<u>,</u> reduce the amplitude of local vibrations and, in particular, increase the bending resistance of the tooth to the pressure force exerted by the chips pressed against the front face.

Replace the paragraph at page 3, line 30 with the following rewritten paragraph.

The manufacturing cost of the insert can thus be ~~restricted since~~ <u>limited because</u> the controlled quality of the flank surface applies only to a limited thickness.

Replace the paragraph at page 4, line 2 with the following rewritten paragraph.

In one [~~form of~~ embodiment ~~of interest~~, the profile of the bracing part corresponds to a determined geometrical curve that connects directly to a back end of the profile of the flank area.

Replace the paragraph at page 4, line 5 with the following rewritten paragraph.

In another ~~form of~~ embodiment ~~of interest~~, the profile of the bracing part connects, at a back end of the profile of the flank area, by a section of curve with a relief angle with a set-back, having an average relief angle representing an extreme value, in relation to the remainder of the profile of the bracing part, [[said]] <u>the</u> remainder having a relief angle of the same sign as the extreme value, or the opposite sign, for an extreme set-back value of the profile, followed by an advance in the form of a spur.

Replace the paragraph at page 4, line 12 with the following rewritten paragraph.

In such a case, [[said]] <u>the</u> remainder of the profile of the bracing part can have an average relief angle that is greater than, equal to, or even ~~smaller~~ <u>less</u> than the overall relief angle of the flank area, [[since]] <u>because</u> the set-back makes it possible to ensure the desired clearance of the heel in relation to the work-piece.

Replace the paragraph at page 4, line 17 with the following rewritten paragraph.

The section of curve with a relief angle with a set-back preferably has a set-back with a lateral extension of between 1 and 50% of a lateral height [[value]] of the tooth. The profile of the flank area can, for example, be either straight or curvilinear.

Replace the paragraph at page 4, line 21 with the following rewritten paragraph.

In one preferred ~~form of~~ embodiment, the forward volume part of the tooth has a thickness of between 10 and 50% of a thickness value of the insert.

Replace the paragraph at page 4, line 24 with the following rewritten paragraph.

When the flank area has different surfaces extending substantially in respective planes inclined at different bevel angles in relation to a direction of penetration perpendicular to a surface of the work-piece, the relief angle of the flank area can ~~follow an increasing law~~ <u>increase</u> as a function of the bevel angle, representing, for example, substantially the sine of the bevel angle. The angle can ~~comprise~~ <u>include</u> a minimum threshold constant, representing a minimum clearance value.

Replace the paragraph at page 4, line 31 with the following rewritten paragraph.

The profile of the bracing part can correspond, according to a ~~determined law~~ <u>function</u> of resistance to rearward bending ~~due to~~ <u>resulting from</u> cutting, to a smooth curve of moment of

inertia in as to bending, as a function of a current height position in the tooth, with the smooth curve having discontinuities, or breaks, of slope limited to an upper threshold value.

Replace the paragraph at page 5, line 3 with the following rewritten paragraph.

~~Localised~~ Localized stress ~~due to~~ resulting from bending forces and vibrations is thus limited.

Replace the paragraph at page 5, line 10 with the following rewritten paragraph.

The tooth can, in particular, laterally present a determined bevel angle for widening starting from a beak tip edge, and the bracing part of the tooth comprises two flanks with a relief angle that ~~is variable according to a law of growth varying~~ varies in the same direction as said widening, and designed to smooth [[said]] the curve, of moment of inertia, by, at least partial, compensation for [[said]] the widening. The forward volume part of the tooth can further have a thickness that is ~~variable according to a smoothing law designed~~ varies to compensate, at least partially, for variations in the moment of inertia due to said widening and to the variable relief angle of the two flanks of the bracing part.

Replace the paragraph at page 5, line 21 with the following rewritten paragraph.

The present invention will be more readily understood with the help of the following detailed description of two examples of ~~forms of embodiment of interest~~ embodiments of the

insert according to the present invention, usable in these two examples for external or internal thread cutting, with reference to the annexed drawings, wherein:

Replace the paragraph at page 5, line 26 with the following rewritten paragraph.

FIG. 1 is a partial view of a cross-section of a bore during internal thread cutting using a thread cutting insert according to the first ~~form of~~ embodiment of the invention;

Replace the paragraph at page 5, line 32 with the following rewritten paragraph.

FIG. 4 is equivalent to FIG. 3 and corresponds to the second ~~form of~~ embodiment, for a tooth having another lateral profile; and

Replace the paragraph at page 6, line 8 with the following rewritten paragraph.

Insert 10 has [[here]] substantially the shape of a rectangular parallelepiped, with a front face or surface 21 and a back face or surface 24. For the sake of simplicity, faces 21 and 24 are supposed [[here]]to be horizontal. One of four lateral, horizontally extending teeth seen in FIG. 2 bears reference number 30 in FIGS. 1 to 3. Tooth 30 has a determined cutting height represented by its lateral extension, projecting from a virtual reference plane, substantially vertical in the figures, tangent to the valleys separating the teeth. Tooth 30 comprises a front face, or cutting face, 31 forming part of front face 21, but which has been ground so as to hollow it out slightly

obliquely towards the ~~centre~~ center of front face 21 in order to facilitate sliding of the chips in this direction.

Replace the paragraph at page 7, line 2 with the following rewritten paragraph.

Summit edge 33 has a relief angle D of forward part 30A of tooth 30 in relation to the direction, which is vertical here, of feed of insert 10 in relation to the work-piece, and beak tip edge 32, defined by cutting front face 31 and summital edge 33, thus has an addendum angle T with a slightly acute lateral profile. The two opposed flanks 31F of the U shape also have a relief angle, which can, however, be limited without any problem, [[since]] because the risk of rubbing of the rear heel connected with the curvature of the orifice applies only to summital edge 33, extending in the plane of FIG. 1, transverse to the orifice. In this example, flanks 31F and root 33 of the U have been ground to form respective plane surfaces, so that the relief angle remains constant over the entire thickness of the lateral surface under consideration. Otherwise, it would be necessary to consider an overall, or mean, value for the relief angle.

Replace the paragraph at page 7, line 29 with the following rewritten paragraph.

Tooth 30 thus extends into rear layer 23, in the form of a rear part 30B, forming a counter-bearing root or pedestal, which generally has the U-shaped front profile of forward part 30A. However, rear part 30B is laterally set back in relation to a virtual prolongation of the line segment of summital edge 33, that is to say, it generally has an average relief angle greater than

forward relief angle D, so as to provide an increased clearance gap in relation to the work-piece so as to avoid any rubbing of a heel 37 of back face 24.

Replace the paragraph at page 8, line 17 with the following rewritten paragraph.

As mentioned initially, the forward relief angle D may be nil if, alternatively, the application relates to external thread cutting. In this case, as there is no risk of heel 37 rubbing, it is possible for rear part 30A to have only a very small rear relief angle E, that is to say it can ensure very efficient counter-bearing while not necessitating grinding [[since]] <u>because</u> it stands back by more than a minimum clearance threshold.

Replace the paragraph at page 8, line 23 with the following rewritten paragraph.

In the case of thread cutting a cylinder of a determined diameter, the rear part 30B would have a profile with an advancing, or "negative", overall relief angle. This can be, for example, an arc of circle parallel to the surface machined in order to surround it with a minimum clearance, that is to say, with a heel 37 laterally projecting beyond point of junction 34 of the two summital edges 33, 36, or even beak tip edge 32.

Replace the paragraph at page 9, line 17 with the following rewritten paragraph.

The same type of profile, having a discontinuity or break of slope 45, is to be found at the back end connecting each of the two flanks 41F of the U shape of the forward part 40A with two

respective flanks of a U shape of the rear part 40B, that is to say, the type of profile shown in FIG. 4 would still be applicable if the vertical plane of cutting of tooth 40 were to be rotated about a vertical. As mentioned earlier, discontinuity 45 can, however, be gradually reduced in proportion to movement away from a plane of cross-sectional representation, passing via summital edge 43, as in FIG. 4, and perpendicularly to the machined surface of the work-piece.

Replace the paragraph at page 9, line 26 with the following rewritten paragraph.

Penetration of the work-piece is, in fact, maximum for the beak tip edge 42, which is moved to the left, hence perpendicularly to its direction of extension, horizontal and parallel to the vertical plane of the surface machined, and further perpendicular to the plane of FIG. 4. On the other hand, flanks 41F, or the legs of the U, are turned back, by an angle which is here as much as almost 90 degrees, for example, approximately 85 degrees here, in globally a plane of direction oblique in relation to the direction of extension of the beak tip edge 42, hence also in relation to the surface to be machined. Flanks 41F thus have a penetration machining component that is reduced according to the cosine of the turn-back angle, of approximately 85 degrees. Penetration thickness is thus similarly reduced, which makes it possible to have a smaller relief angle, reduced as a function of the turn-back angle, and, for example, varying substantially like the cosine of the turn-back angle.

Replace the paragraph at page 10, line 7 with the following rewritten paragraph.

In other words, and taking as a reference the normal direction of machining (horizontal in FIG. 4), and not the direction of extension of the beak tip edge 42 (perpendicular to the plane of FIG. 4), the flank area 43, 43F has different surfaces, frontal and lateral, extending substantially in planes inclined at different bevel angles B (90d--turn-back angle), with, respectively, a bevel angle B of 90 degrees in the case of beak tip edge 42 and 5 degrees here in that of the two flanks 41F, in relation to the direction of penetration perpendicular to a surface of the work-piece. Relief angle D of the flank area 43, 43F increases ~~by following a law which is~~ as a function of the bevel angle B in relation to the normal direction of machining. The [[law]] function can then ~~substantially represent~~ be the sine of the bevel angle B [[on]] in the direction of machining. As a safety clearance, provision may be made for adding a constant minimum-threshold value to the value thus calculated, or just clipping it in terms of minimum value.

Replace the paragraph at page 10, line 23 with the following rewritten paragraph.

In the above two examples, the lateral tooth profiles are rectilinear. Alternatively, as mentioned earlier, they can be of a different shape, for example, curvilinear, or even circular, with ~~profile~~ profiles 36, 46 of the rear [[part]] parts 30B, 40B standing back in relation to the virtual prolongation, of forward summital edge 33, 43, defined by a ~~geometrical law~~ geometric function defining the lateral profile under consideration. The forward offset angle D or rear offset angle E to be considered is then the average, or overall, relief angle.

Replace the paragraph at page 10, line 30 with the following rewritten paragraph.

In the case of external thread cutting, the lateral profiles of rear parts 30B and 40B would be located in a position substantially symmetrical in relation to the plane, which is vertical in the figures, containing junction [[point]] points 34, 44, that is to say [[heel]] , heels 37, 47 would form a spur, with a negative relief angle E, F, extending laterally beyond junction [[point]] points 34, 44, and, preferably, beyond beak tip [[edge]] edges 32, 42. Dashed lines 36', 46' thus represent the position of the spur variant of profile 36, 46 that has rotated by a certain angle about its connection with curved ~~section~~ sections 33, 45. If applicable, ~~profile~~ profiles 33, 43 of forward [[part]] parts 30A, 40A can also have a relief angle D that is nil, or even negative.

Replace the paragraph at page 11, line 7 with the following rewritten paragraph.

Insert 10 and, in particular, tooth 40 constitutes, from a mechanical viewpoint, a beam having a lateral profile, in vertical cross-section in FIG. 4, such that its moment of inertia I, that is to say, the moment I or couple of bending strength ~~materialised~~ materialized by the downward recoil of cutting edge 41A during cutting, increases in quadratic fashion as a function of the thickness in question. Current thickness can thus be specified as a function of a variable which, in FIG. 5, is the distance X between a current point and a reference point which is beak tip edge 42, when going towards the base of tooth 40, that is to say, substantially towards hole 11, hence to the right along a horizontal in the plane of FIG. 4.

Replace the paragraph at page 11, line 17 with the following rewritten paragraph.

Depending on the distance X between beak tip edge 42 and a current cross-section, of tooth 40, for which the moment of inertia I is considered, the current moment of inertia I, local in the section under consideration, first has a first segment I1 increasing according to a first[[,]] quadratic ~~, law,~~ growth functions over a first range of horizontal movement ending perpendicularly to back end 44 of forward summital edge 43.

Replace the paragraph at page 11, line 23 with the following rewritten paragraph.

Then, perpendicularly to intermediate connecting section 45, which is curved here, moment of inertia I has a second segment I2, which is intermediate, with a second [[law]] quadratic growth function for which growth initially continues in a more limited manner, owing to the fact that the beginning of curve 45, close to connecting point 44, has a slope[[,]] of ~~increase of~~] increasing thickness of insert 10, that is less than the slope of rear summital edge 43, in relation to the direction of the plane of the section under consideration, that is to say, a vertical in FIG. 4. In other words, the second segment 12 of curve remains short of a curve of extrapolation of the first moment of inertia I curve segment I1.

Replace the paragraph at page 11, line 32 with the following rewritten paragraph.

A third segment 13 of the curve of moment of inertia I, perpendicularly to the range, corresponding to the rear rectilinear summital edge 46, presents additional growth according to a

third ~~law, that of~~ quadratic growth function. The third [[law]] quadratic growth function corresponds substantially to the first [[law]] quadratic growth functions, with, however, on one hand, a shift of the value of the distance variable X,[~~due to~~ as a result of the presence of the set-back associated with the second segment I2 and, on the other hand, a weighting (90d--F) of quadratic growth, which is smaller, [[since]] because rear relief angle F is greater, here, than forward relief angle D. The beginning of the third segment I3 is in the prolongation of the end of the second segment as intermediate section 45 has an end section aligned with rear edge 46.

Replace the paragraph at page 12, line 10 with the following rewritten paragraph.

After heel 47, a fourth segment I4 of the curve of moment of inertia I corresponds to a horizontal, i.e., a moment of inertia I remaining constant.

Replace the paragraph at page 12, line 16 with the following rewritten paragraph.

The shapes of the curves of moment of inertia I above are, in fact, "basic curves", corresponding to an imaginary slice of metal of tooth 40 cut parallel to the plane of FIG. 4, that is to say, having a constant width (or slice thickness), this width being measured perpendicularly to the plane of FIG. 4. In the present case, the width of tooth 40, perpendicularly to the plane of FIG. 4, varies according to three parameters.

Replace the paragraph at page 12, line 22 with the following rewritten paragraph.

The first parameter is the angle of inclination of each leg of the U, formed by flanks 41F, in relation to the direction of extension of beak tip edge 42, which is itself parallel to the surface of the work-piece. As mentioned earlier, cutting edge 41A has, in top, face, view, the legs of a U-shape which rise, diverging slightly, that is to say, they are each turned back at an angle of 85 degrees, for example, in relation to beak edge 42 at the bottom of the U. This first parameter, of widening of tooth 40, thus tends to increase the moment of inertia as to bending, in proportion to this widening.

Replace the paragraph at page 13, line 4 with the following rewritten paragraph.

Steps can then be taken to adjust these three parameters mutually so that moment of inertia I varies only smoothly, or even remains substantially constant, in order to avoid breaks of slope in its curve, liable to correspond to positions of cross-sections subjected to shearing stresses that are higher than elsewhere and thus leading to a risk of accelerated deterioration, in particular, with the vibrations associated with machining.

Replace the paragraph at page 13, line 10 with the following rewritten paragraph.

For this purpose, to avoid or limit the acuteness of any point of connection angle between the segments, connecting section 45 can then be modified to have a rectilinear profile, or a cambered one, or, better still, an S-shaped profile. In the last case, connecting section 45

comprises a convex forward part with a forward end section extending substantially in the direction of forward edge 43, to which it is connected, and comprises a concave rear end part, as drawn, extending substantially in the direction of associated rear edge 46. There is thus no discontinuity in the evolution of the value of moment of inertia I at each end of the second curve segment I2. Furthermore, the S-shape can be designed so that, between the two end parts above, <u>the</u> moment of inertia curve I2 is substantially rectilinear, thus even further limiting any risk of ~~localised~~ <u>localized</u> stress.

Replace the paragraph at page 13, line 22 with the following rewritten paragraph.

As to the growth of inertia curve third segment I3, perpendicularly to rear edge 46, the diverging of the legs of the U-shape of tooth 40 and the relief angle of flanks 41F have, as indicated, effects, which are positive and negative, respectively, on the variation of tooth width, which effects are reflected substantially linearly in this growth. By adjusting the third parameter, that is to say the current thickness of forward part 40A as a function of the distance X to beak tip edge 42, it is possible to smooth the curve of <u>the</u> moment of inertia I. The current thickness that is suitable for forward part 40A, as a function of the desired value for <u>the</u> moment of inertia I, is determined using an inverse transform of the aforementioned quadratic [[law]] <u>growth function</u>.

Replace the paragraph at page 13, line 33 with the following rewritten paragraph.

For example, if the relief angle of flanks 41 remains constant over the entire height (horizontal in FIG. 4) of tooth 40, the width of tooth 40 will thus grow linearly, in relation to the above-mentioned "basic" curve, going to the right, towards the valley of tooth 40. Furthermore, the two flanks 40BF of part 40B, also standing back in relation to a plane prolonging forward flanks 41F, also have a relief angle F1, in particular, in their area close to the rear edge 46 to be considered in connection with inertia curve third segment I3. Rear flanks 40B similarly contribute to the increase in inertia.